REMARKS

In the last Office Action, the Examiner objected to the specification as containing informalities. Claim 16 was objected to under 37 C.F.R. §1.75 as being a substantial duplicate of claim 15. Claim 1 was rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1-6, 10-16 and 19-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Publication No. 2001/0055459 A1 to Yamada et al. ("Yamada") in view of U.S. Patent No. 5,738,576 to Ohno et al. ("Ohno"). Claims 7-9 and 17-18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Yamada in view of Ohno and further in view of U.S. Patent No. 6,257,971 to Takahashi et al. ("Takahashi"). Additional art was cited of interest.

In accordance with the present response, the specification has been suitably revised to correct informalities, including those noted by the Examiner, provide antecedent basis for the claim language, and bring it into better conformance with U.S. practice. Original claims 1-20 have been replaced with new claims 21-34 to further patentably distinguish from the prior art of record, improve the wording, overcome the objection and indefiniteness rejection raised by the Examiner, and provide a fuller scope of coverage. The

title of the invention has been changed to "JIG PLATE, END FACE POLISHING MACHINE HAVING JIG PLATE, AND END FACE POLISHING METHOD" to more clearly reflect the invention to which the new claims are directed. A new, more descriptive abstract has been substituted for the original abstract.

Applicants request reconsideration of their application in light of the following discussion.

Brief Summary of the Invention

The present invention is directed to a jig plate for supporting an optical connector plug and for use in combination with an end face polishing machine for polishing end faces of an optical fiber and a ferrule of the optical connector plug. The present invention is also directed to an end face polishing method.

Prior to use in an optical connector, an optical communication fiber is adhered and fixed to a center hole of a ferrule and then an end surface of the ferrule and an end surface of the fiber are simultaneously polished to provide a smooth mirror surface. If the polished surfaces of the ferrule and the fiber are not vertical to a center axis of the ferrule, or if the polished surfaces are damaged, the accuracy of an optical connector having such ferrules connected with each other is deteriorated, thereby resulting in an increase

in signal loss. Therefore, it is required that the surfaces of the ferrule and the optical fiber be polished with high accuracy.

In a conventional end face polishing apparatus, an eccentric plate which rotates on a concentric circle of a self-rotation disc and a planetary gear which transmits rotation of a motor for revolution to the eccentric plate are combined with a polishing plate to cause the polishing plate to self-rotate and revolve. The end faces of the ferrules and optical fibers supported by a jig plate are pressed against the polishing member fixed to the polishing plate and polished. However, with the conventional end face polishing apparatus, it has been difficult to polish the end faces of the ferrules and optical fibers without causing variations in the polishing angle, radius of curvature and eccentricity. Further variations in ferrule lengths also occur after polishing.

The present invention overcomes the drawbacks of the conventional art. With reference to an embodiment shown in Figs. 1-9, the optical connector plug 100 is comprised of a plug housing 140 for supporting a ferrule 110 fixed to an end of an optical fiber 2 and a connecting member 145 connected to an exterior surface of the plug housing 140. The optical connector plug has a first axis 203 extending along the

exterior surface thereof in a longitudinal direction of the connecting member 145. The end face polishing machine is comprised of a polishing member 27 having a polishing surface for undergoing rotational movement in a first direction of rotation to polish an end face of the ferrule 110 and an end face of the optical fiber 2 during a polishing operation.

The jig plate 40 has a jig plate body 50 and a mounting part 54 connected to the jig plate body 50 for mounting the jig plate 40 on the end face polishing machine. A holding part 51 is formed in a surface of the jig plate body 50. A holding member 60 removably supports the optical connector plug 100 in the holding part so that the end face of the ferrule 110 and the end face of the optical fiber 2 confront the polishing surface of the polishing member 27 when the jig plate 40 is mounted on the end face polishing machine. The holding member 60 has an engaging portion 62 for detachable engagement with the connecting member 145 of the optical connector plug 100 to removably support the optical connector plug 100 so that during a polishing operation, the ferrule 110 rotates in a second direction of rotation opposite to the first direction of rotation while the end face of the ferrule 110 and the end face of the optical fiber 2 contact the polishing surface of the polishing member 27 at a preselected angle of inclination and while an axis 200

extending in the direction of inclination of the end face of the ferrule 110 and the end face of the optical fiber 2 coincides with a second axis 201 of the optical connector plug 100 disposed generally orthogonal to the first axis 203.

By the foregoing construction of the present invention, during a polishing operation the optical connector plug can be maintained at a precise orientation relative to the polishing member so that an axis extending in the direction of inclination of the end face of the ferrule and the end face of the optical fiber coincides with an axis of the optical connector plug disposed generally orthogonal to another axis of the optical connector plug extending along an exterior surface thereof in a longitudinal direction of the connecting member which is disposed on the exterior surface. By this orientation, the end face of the ferrule and the end face of the optical fiber are polished with improved polishing accuracy to reduce displacement between the center of curvature of the end faces of the ferrule and optical fiber and a central axis of the optical fiber, thereby reducing insertion loss.

The prior art of record does not disclose or suggest the structural and functional combinations recited in newly added claims 21-38.

New independent claim 21 is directed to a jig plate for supporting an optical connector plug and which is used in combination with an end face polishing machine for polishing the end face of an optical fiber and the end face of a ferrule fixed to an end of the optical fiber. Claim 21 requires that the optical connector plug has a plug housing for supporting the ferrule and a connecting member connected to an exterior surface of the plug housing, the optical connector plug having a first axis extending along the exterior surface thereof in a longitudinal direction of the connecting member. Claim 21 further requires that the end face polishing machine is comprised of a polishing member having a polishing surface for undergoing rotational movement in a first direction of rotation to polish an end face of the ferrule and an end face of the optical fiber during a polishing operation.

Claim 21 further requires a jig plate comprised of a jig plate body, a mounting part connected to the jig plate body for mounting the jig plate on the end face polishing machine, a holding part formed in a surface of the jig plate body, and a holding member for removably supporting the optical connector plug in the holding part so that the end face of the ferrule and the end face of the optical fiber confront the polishing surface of the polishing member when the jig plate is mounted on the end face polishing machine.

Claim 21 further requires that the holding member has an engaging portion for detachable engagement with the connecting member of the optical connector plug to removably support the optical connector plug so that during a polishing operation, the ferrule rotates in a second direction of rotation opposite to the first direction of rotation while the end face of the ferrule and the end face of the optical fiber contact the polishing surface of the polishing member at a preselected angle of inclination and while an axis extending in the direction of inclination of the end face of the ferrule and the end face of the optical fiber coincides with a second axis of the optical connector plug disposed generally orthogonal to the first axis.

The structural and functional combination recited in new independent claim 21 is not disclosed or suggested by the prior art of record. For example, Yamada discloses a ferrule holder assembly for an optical fiber end face grinding apparatus (Figs. 1-4). A jig plate 1 is mounted opposite to a polishing plate 13 for polishing an end face of a ferrule 8 holding an optical fiber 9. The jig plate 1 has a jig plate body with a holding part 2 (i.e., an adapter) for holding the ferrule 8 at an inclination relative to a surface of the polishing plate 13 during a polishing operation.

However, the jig plate disclosed in Yamada does not have a holding member having an engaging portion for detachable engagement with a connecting member of the optical connector plug to removably support the optical connector plug so that during a polishing operation, the ferrule rotates in a second direction of rotation opposite to the first direction of rotation, as recited in claim 21. Stated otherwise, claim 21 requires that an engaging portion of the holding member is configured for detachable engagement with a connecting member connected to an exterior surface of the plug housing while permitting rotation of the ferrule in a direction of rotation opposite to the direction in which the polishing plate rotates during a polishing operation. The structural combination of the ferrule holder assembly disclosed by Yamada clearly does not permit the ferrule 8 and optical fiber 9 to rotate in a direction opposite to the rotating direction of the polishing plate 13.

Moreover, claim 21 requires that the engaging portion of the holding member detachably engages with a connecting member of the optical connector plug to removably support the optical connector plug so that during a polishing operation, the end face of the ferrule and the end face of the optical fiber contact the polishing surface of the polishing member at a preselected angle of inclination while an axis

extending in the direction of inclination of the end face of the ferrule and the end face of the optical fiber coincides with a second axis of the optical connector plug disposed generally orthogonal to the first axis. Stated otherwise, claim 21 requires that the axis of the optical connector plug extending in the direction of inclination of the end face of the ferrule and the end face of the optical fiber coincides with another axis of the optical connector plug which is generally orthogonal to an axis (i.e., first axis) of the optical connector plug extending along the exterior surface thereof in a longitudinal direction of the connecting member. This relationship between the axes of the optical connector plug and the end faces of the ferrule and optical fiber, which are based on the positioning of a connecting member of the optical connector plug, is clearly not disclosed or suggested by Yamada.

New independent claim 28 is directed to a jig plate for use with an end face polishing machine having a polishing member for undergoing rotation in a first direction of rotation to polish end faces of an optical fiber and a ferrule fixed to an end of the ferrule of an optical connector plug during a polishing operation. Claim 28 requires that the jig plate has a holding member for removably supporting the optical connector plug in the holding part so that the end

faces of the ferrule and optical fiber confront a polishing surface of the polishing member when the jig plate is mounted on the end face polishing machine, the holding member having an engaging portion for detachable engagement with a connecting member of the optical connector plug to removably support the optical connector plug so that during a polishing operation, the end faces of the ferrule and optical fiber rotate in a second direction of rotation opposite to the first direction of rotation while contacting a polishing surface of the polishing member at a preselected angle of inclination and while an axis extending in the direction of inclination of the end faces of the ferrule and optical fiber coincides with a first axis of the optical connector plug disposed generally orthogonal to a second axis of the optical connector plug extending along an exterior surface thereof on which the connecting member is disposed and extending in a longitudinal direction of the connecting member. No corresponding structural and functional combination is disclosed or suggested by the prior art of record as set forth above for independent claim 21.

New independent claim 34 is directed to an end face polishing method and requires the step of providing an optical connector plug having a ferrule fixed to an end of an optical fiber, an exterior surface, a connecting member connected to

the exterior surface, and a first axis extending along the exterior surface thereof in a longitudinal direction of the connecting member. Claim 34 further requires the steps of providing a polishing member mounted for undergoing rotational movement in a first direction of rotation, providing a jig plate comprised of a body and a holding part formed in a surface of the body, and removably mounting the optical connector plug in the holding part of the jig plate so that the ferrule extends at a preselected angle of inclination relative to the surface of the body and so that an axis extending in the direction of inclination of end faces of the optical fiber and ferrule coincides with a second axis of the optical connector plug disposed generally orthogonal to the first axis.

Claim 34 further requires the steps of moving the jig plate to bring the end faces of the optical fiber and ferrule into pressure contact with a polishing surface of the polishing member, and rotating the polishing member to polish the end faces of the optical fiber and ferrule while the end faces of the optical fiber and ferrule rotate in a second direction of rotation opposite to the first direction of rotation and while the axis extending in the direction of inclination of the end faces of the optical fiber and ferrule coincides with the second axis of the optical connector plug.

The prior art of record does not disclose the combination of steps recited in claim 34. For example, as set forth above for independent claim 21, the ferrule holder assembly in Yamada does not have any structure which permits the end faces of the optical fiber and ferrule to rotate in a direction of rotation opposite to the direction in which the polishing member is rotated during a polishing operation. Likewise, Yamada does not disclose or suggest that during a polishing operation, an axis extending in the direction of inclination of the end faces of the optical fiber and ferrule coincides with a second axis of the optical connector plug disposed generally orthogonal to the an axis of the optical connector plug extending along an exterior surface thereof in a longitudinal direction of the connecting member of the optical connector plug, as recited in claim 34.

New claims 22-27 and 29-33 depend on and contain all of the limitations of amended independent claims 21 and 28, respectively, and, therefore, distinguish from the references at least in the same manner as claims 21 and 28.

Moreover, there are separate grounds for patentability of several of the new dependent claims.

New claims 23, 25, 29 and 31 are directed to the structure of the connecting member of the optical connector plug and the structural connection between the connecting

member and the holding member or body of the jig plate. No corresponding structure is disclosed or suggested by the prior art of record.

New claims 26, 27, 32 and 33 are directed to the structure of the holding member of the jig plate and the positional relationship between the holding member and the holding part on the body of the jig plate. Again, no corresponding structure is disclosed or suggested by the prior art of record.

In view of the foregoing amendments and discussions, the application is believed to be in allowable form. Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

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January 31, 2005
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